

28-OCT-09  
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GEORGIA DEPARTMENT OF TRANSPORTATION  
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN  
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM  
REVISED: JUNE 30, 2008  
32' CURB-CURB; 5 BEAMS; 140' SPAN; 50' TALL; BRIDGE 13 ; PIER 2

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP				
OPTIONS											EC	ES	STRAIN	FACT	MAIN SIZE	STR SIZE	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	TOP CL.	MIN S.SP	DEPTH INCR.	BOT CL.
D D D L	2	1	8	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00

COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	17.625	4.000	4.000	6.000	6.000	4.000	13.625	14.000	7.000	3.000					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		50.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND INTENSITIES

WIND	TRANS.	LONG.	WIND	FT1	FT1	WIND	FT2	FT2	WIND	FT3	FT3	WIND	FT4	FT4	WIND	FT5	FT5	* WIND	ON	PIER
																		APT	PL	PL
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	6.475	15.027				

GROUP III WIND

STD.	* WIND	ON	SUPERSTRUCTURE	INTENSITIES	* STD.	* WIND	ON	LIVE	LOAD	INTENSITIES	* LENGTHS	OF	LL	* WIND	ON	LL	ARMS								
WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	TRANS.	LONGI.	APT	APT	APT	APT	APT								
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL	
0.000	9.860	15.583	15.583	0.00018000	0.00044000	0.000	0.000	

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	265.598	299.028	0.000	299.028	0.000	299.028	265.598					
LL 1	1	78.521	58.890	0.000	0.000	0.000	0.000	0.000					
LL 2	2	78.521	98.151	0.000	78.521	0.000	19.630	0.000					
LL 3	1	0.000	0.000	0.000	0.000	0.000	58.890	78.521					
LL 4	2	0.000	19.630	0.000	78.521	0.000	98.151	78.521					
LL 5	1	0.000	29.445	0.000	78.521	0.000	29.445	0.000					
LL 6	2	58.890	107.966	0.000	78.521	0.000	29.445	0.000					
LL 7	2	9.815	78.521	0.000	98.151	0.000	78.521	9.815					
LL 8	2	78.521	58.890	0.000	0.000	0.000	58.890	78.521					

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

\* LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	50.000	0.000	0.000	0.000	6.000	1.000	50.000	50.000
DEAD LOAD TOTAL	1	1633.030 1949.830	0.000	0.000	0.000	1949.830	6609.005	-6609.005	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-212.808	-9.860	-646.648	-646.648
WIND ON SUBSTR.	1	0.000	-38.850	6.475	323.750	0.000	0.000	0.000	-90.162	-15.027	-751.350	-751.350
GROUP 2 WIND 1 1	1	0.000	-951.694	74.725	4239.594	0.000	0.000	0.000	-90.162	-15.027	-751.350	-751.350
GROUP 2 WIND 1 2	1	0.000	-951.694	74.725	4239.594	0.000	0.000	0.000	90.162	15.027	751.350	751.350
GROUP 2 WIND 2 1	1	0.000	-842.152	66.535	3769.693	0.000	0.000	0.000	-309.245	-31.407	-1691.153	-1691.153
GROUP 2 WIND 2 2	1	0.000	-842.152	66.535	3769.693	0.000	0.000	0.000	309.245	31.407	1691.153	1691.153
GROUP 2 WIND 3 1	1	0.000	-787.382	62.440	3534.742	0.000	0.000	0.000	-528.327	-47.787	-2630.955	-2630.955
GROUP 2 WIND 3 2	1	0.000	-787.382	62.440	3534.742	0.000	0.000	0.000	528.327	47.787	2630.955	2630.955
GROUP 2 WIND 4 1	1	0.000	-641.327	51.520	2908.207	0.000	0.000	0.000	-674.382	-58.707	-3257.490	-3257.490
GROUP 2 WIND 4 2	1	0.000	-641.327	51.520	2908.207	0.000	0.000	0.000	674.382	58.707	3257.490	3257.490

GROUP	WIND	5	1	1	0.000	-349.217	29.680	1655.137	PIER-32-5-140-50.OUT	0.000	0.000	0.000	-783.923	-66.897	-3727.391	-3727.391	
GROUP 2	WIND 5 2	1	1	1	0.000	-349.217	29.680	1655.137	0.000	0.000	0.000	783.923	66.897	3727.391	3727.391		
GROUP 3	WIND 1 1	1	1	1	0.000	-587.670	36.417	2190.040	0.000	0.000	0.000	-27.049	-4.508	-225.405	-225.405		
GROUP 3	WIND 1 2	1	1	1	0.000	-587.670	36.417	2190.040	0.000	0.000	0.000	27.049	4.508	225.405	225.405		
GROUP 3	WIND 2 1	1	1	1	0.000	-518.548	32.280	1938.890	0.000	0.000	0.000	-165.292	-12.782	-727.705	-727.705		
GROUP 3	WIND 2 2	1	1	1	0.000	-518.548	32.280	1938.890	0.000	0.000	0.000	165.292	12.782	727.705	727.705		
GROUP 3	WIND 3 1	1	1	1	0.000	-483.987	30.212	1813.315	0.000	0.000	0.000	-303.536	-21.056	-1230.004	-1230.004		
GROUP 3	WIND 3 2	1	1	1	0.000	-483.987	30.212	1813.315	0.000	0.000	0.000	303.536	21.056	1230.004	1230.004		
GROUP 3	WIND 4 1	1	1	1	0.000	-391.825	24.696	1478.449	0.000	0.000	0.000	-395.698	-26.572	-1564.871	-1564.871		
GROUP 3	WIND 4 2	1	1	1	0.000	-391.825	24.696	1478.449	0.000	0.000	0.000	395.698	26.572	1564.871	1564.871		
GROUP 3	WIND 5 1	1	1	1	0.000	-207.500	13.664	808.716	0.000	0.000	0.000	-464.820	-30.709	-1816.021	-1816.021		
GROUP 3	WIND 5 2	1	1	1	0.000	-207.500	13.664	808.716	0.000	0.000	0.000	464.820	30.709	1816.021	1816.021		
LIVE LOAD	LL 1	1	1	1	137.411	-1511.524	0.000	1511.524	137.411	1511.524	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL 2	1	1	1	274.823	-1648.941	0.000	1648.941	274.823	1786.351	-137.410	0.000	0.000	0.000	0.000	0.000	

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	PC	MT	TRANSVERSE						LONGITUDINAL				
				V	MB	RF	ML	MR	MT	V	MB	MF		
LIVE LOAD LL 3	1	137.411	1511.524	0.000	-1511.524	137.411	0.000	-1511.524	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	274.823	1648.941	0.000	-1648.941	274.823	137.410	-1786.351	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	137.411	0.000	0.000	0.000	137.411	206.115	-206.115	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	274.822	-1374.107	0.000	1374.107	274.822	1580.222	-206.115	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	274.823	0.000	0.000	0.000	274.823	687.057	-687.057	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	274.822	0.000	0.000	0.000	274.822	1511.524	-1511.524	0.000	0.000	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

CAP MOMENTS AND SHEARS

POINT	D.L.TOT.	MOMENTS(KIP-FEET)						SHEARS(KIPS)					
		G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT
P 1	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-19.222	-364.499	-19.222	-364.499	-19.222	-534.968
P 2	-2749.772	-2749.772	-3943.056	-2749.772	-2749.772	-2749.772	-3464.313	-414.391	-803.127	-414.391	-803.127	-584.860	-1186.682
P 3	-5198.182	-5198.182	-7542.130	-5198.182	-5198.182	-5198.182	-6601.744	-829.661	-829.661	-829.661	-829.661	-1213.216	-1213.216
C 1L	-8591.707	-8591.707	-12469.875	-8591.707	-8591.707	-8591.707	-10913.963	-867.101		-867.101		-1250.656	
C 1R	-8591.707	-8591.707	-12469.875	-8591.707	-8591.707	-8591.707	-10913.963		867.101		1250.656		867.101
P 5	-5198.182	-5198.182	-7542.130	-5198.182	-5198.182	-5198.182	-6601.744	829.661	829.661	1213.216	1213.216	829.661	829.661
P 6	-2749.772	-2749.772	-3943.056	-2749.772	-2749.772	-2749.772	-3464.313	803.127	414.391	1186.682	584.860	803.127	414.391
P 7	-33.476	-33.476	-33.477	-33.476	-33.476	-33.476	-33.477	364.499	19.222	534.968	19.222	364.499	19.222

PT.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
			AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.	AV/IN	BAR&SPAC					
P 1	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	0.00	0.00	#5@ 0.00	24.00	0.060	#5@10.33	60.77		0.08	0.000	0.098
P 2	-2115.209	-2664.856	10.88	7 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.141	#5@ 4.38	85.43		0.19	0.577	1.351
P 3	-3998.602	-5078.265	18.58	12 # 11	3.12	2 # 11	24.00	0.115	#5@ 5.40	24.00	0.115	#5@ 5.40	96.00		0.31	0.587	1.125
C 1	-6609.005	-8395.356	31.34	21 # 11	3.12	2 # 11	24.00	0.124	#5@ 5.02	24.00	0.124	#5@ 5.02	96.00		0.52	0.554	0.961
P 5	-3998.602	-5078.265	18.58	12 # 11	3.12	2 # 11	24.00	0.115	#5@ 5.40	24.00	0.115	#5@ 5.40	96.00		0.31	0.587	1.125
P 6	-2115.209	-2664.856	10.88	7 # 11	3.12	2 # 11	24.00	0.141	#5@ 4.38	24.00	0.060	#5@10.33	85.43		0.19	0.577	1.351
P 7	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	60.77		0.08	0.000	0.098

NOTE: \*\*\* FS/FZ RATIO EXCEEDS 1.0! \*\*\*

□ COLUMN ANALYSIS AND DESIGN OUTPUT

CN	T	CRITICAL COLUMN LOADS																	
		B GR	LLC	WC R	E S	C F	S F	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL 2	0.0				2719.6	-3579.9	0.0	2719.6	4128.3	2093.2	9184.7	13949.4	7072.9	3.379	72.00	96.00
1	B	2	4.1					2534.8	3780.7	-4234.7	2534.8	4227.8	5136.1	5641.7	9445.9	11475.3	2.233	72.00	96.00

CN	T	COLUMN DESIGN DATA															
		B FACE 1 NO. SIZE	B FACE 2 NO. SIZE	D FACE 3 NO. SIZE	D FACE 4 NO. SIZE	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC	
1	T	15 # 11	15 # 11	8 # 11	8 # 11	71.76	1.038	1.00	0.000	2925.	22021.	1.153	1.283	1.000	2	0.70	
1	B	15 # 11	15 # 11	8 # 11	8 # 11	71.76	1.038	1.00	0.000	2329.	22021.	1.118	1.213	1.000	2	0.70	

□

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 2	3.1				2181.026	3200.495	30.212-2523.301	-40.776	152.096	41.884	181.730	291.942	108.239	-0.141	45.284		MAX.P1
1	2		1.1				2534.779	5511.472	97.142 -976.755	-19.535	92.946	49.668	298.091	341.369	146.310	-0.183	52.760		MAX.MT
1	2		3.1				2534.779	4595.165	81.172-3420.241	-62.123	167.199	16.687	223.839	374.351	136.555	-0.183	52.760		MAX.VT
1	3	LL 2	3.1				2835.334	4160.644	39.276-3280.291	-53.009	197.724	54.449	236.249	379.524	140.711	-0.183	58.870		MAX.VP
1	2		5.1				2534.779	2151.678	38.584-4845.608	-86.966	253.504	40.438	137.534	350.599	221.873	34.344	52.760		MAX.ML
1	2		5.1				2534.779	2151.678	38.584-4845.608	-86.966	253.504	40.438	137.534	350.599	221.873	34.344	52.760		MAX.VL
1	2		3.1				1949.830	3534.742	62.440-2630.955	-47.787	128.615	12.836	172.183	287.962	105.042	-0.141	40.585		MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE				* BAR REINFORCEMENT STEEL *					SECTION CAPACITIES				*
B	D	T	P1/PA	AS	NO.	SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
13.750	13.750	4.000	0.994	1.08	19	# 8	@ 8.625	TOP TRAN	148.219	37.522	75.044	31.090	0.000
				1.59	15	#11	@11.000	BOT.LONG	236.369	38.976	77.952	32.295	0.000

NUMBER OF PILES = 14 BP = 1.875 DP = 1.875